CLAIMS

WHAT IS CLAIMED IS:

1. A method for speech signal conversion, comprising operations of:

    receiving signals including:

        a formants signal representative of an input speech signal;

        a voicing signal comprising an indication of whether the input speech signal is voiced, unvoiced, or mixed;

        a pitch signal comprising a representation of fundamental frequency of the input speech signal;

        a gain signal comprising a representation of energy in the input speech signal;

    receiving user selection of at least one of multiple voice fonts each specifying a manner of modifying at least one of the received signals;

    modifying at least one of the received signals as specified by the selected voice font;

    providing an output of the received signals incorporating said modifications.

2. The method of claim 1, wherein the modifying operation comprises modifying the formants signal by performing operations comprising:

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converting linear predictive coding coefficients of the formants signal to

linear spectral pairs;

modifying the linear spectral pairs as specified by the selected voice font;

converting the modified linear spectral pairs into linear predictive coding

coefficients. ·

3. The method of claim 1, the modifying operation comprising modifying the

pitch signal by performing operations comprising one of the following:

multiplying the pitch signal by a predetermined coefficient;

multiplying the pitch signal by a matrix of differential coefficients over

time;

replacing the pitch signal with a fixed pitch pattern of one or more levels.

4. The method of claim 1, the modifying operation comprising normalizing the

gain signal to a fixed value.

5. The method of claim 1, the modifying operation comprising changing the

voicing signal to a different value of voiced, unvoiced, or mixed.

6. The method of claim 1, each voice font further specifying a filter type, the

operations further comprising:

filtering the output as specified by the selected voice font.

7. The method of claim 1, the modifying operation comprising:

applying a first conversion to the formants signal;

applying a second conversion, different than the first conversion, to the

pitch signal.

8. A method for speech signal conversion, comprising operations of:

receiving signals including:

a formants signal representative of an input speech signal;

a pitch signal comprising a representation of fundamental

frequency of the input speech signal;

receiving user selection of at least one of multiple voice fonts each

specifying a manner of modifying the formants signal and a

different manner of modifying the pitch signal;

modifying the received signals as specified by the selected voice font;

providing an output of the received signals as modified.

9. A method of processing speech, comprising operations of:

applying linear predictive coding to input speech to yield a formants

output and a residual output;

processing the residual output to yield respective outputs representing

pitch, gain, and voicing of the input speech;

receiving user selection of at least one of multiple predetermined voice

fonts each specifying a manner of modifying at least one of the

formants, pitch, gain, and voicing outputs, and modifying one or

more of the formants, pitch, gain, and voicing outputs according to

the selected voice font;

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recombining the formants, pitch, gain, and voicing outputs including any modifications to form a decoded output signal.

10. A signal-bearing medium tangibly embodying a program of machine-readable instructions executable by a digital processing apparatus to perform speech conversion operations comprising:

receiving signals including:

a formants signal representative of an input speech signal;

a voicing signal comprising an indication of whether the input speech signal is voiced, unvoiced, or mixed;

a pitch signal comprising a representation of fundamental frequency of the input speech signal;

a gain signal comprising a representation of energy in the input speech signal;

receiving user selection of at least one of multiple voice fonts each specifying a manner of modifying at least one of the received signals;

modifying at least one of the received signals as specified by the selected voice font;

providing an output of the received signals incorporating said modifications.

11. The medium of claim 10, wherein the modifying operation comprises modifying the formants signal by performing operations comprising:

converting linear predictive coding coefficients of the formants signal to

linear spectral pairs;

modifying the linear spectral pairs as specified by the selected voice font;

converting the modified linear spectral pairs into linear predictive coding

coefficients.

12. The medium of claim 10, the modifying operation comprising modifying the

pitch signal by performing operations comprising one of the following:

multiplying the pitch signal by a predetermined coefficient;

multiplying the pitch signal by a matrix of differential coefficients over

time;

replacing the pitch signal with a fixed pitch pattern of one or more levels.

13. The medium of claim 10, the modifying operation comprising normalizing

the gain signal to a fixed value.

14. The medium of claim 10, the modifying operation comprising changing the

voicing signal to a different value of voiced, unvoiced, or mixed.

15. The medium of claim 10, each voice font further specifying a filter type, the

operations further comprising:

filtering the output as specified by the selected voice font.

16. The medium of claim 10, the modifying operation comprising:

applying a first conversion to the formants signal;

applying a second conversion, different than the first conversion, to the

pitch signal.

17. A signal-bearing medium tangibly embodying a program of machine-

readable instructions executable by a digital processing apparatus to perform

speech conversion operations comprising:

receiving signals including:

a formants signal representative of an input speech signal;

a pitch signal comprising a representation of fundamental

frequency of the input speech signal;

receiving user selection of at least one of multiple voice fonts each

specifying a manner of modifying the formants signal and a

different manner of modifying the pitch signal;

modifying the received signals as specified by the selected voice font;

providing an output of the received signals as modified.

18. A signal-bearing medium tangibly embodying a program of machine-

readable instructions executable by a digital processing apparatus to perform

speech conversion operations comprising:

applying linear predictive coding to input speech to yield a formants

output and a residual output;

processing the residual output to yield respective outputs representing

pitch, gain, and voicing of the input speech;

receiving user selection of at least one of multiple predetermined voice

fonts each specifying a manner of modifying at least one of the

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formants, pitch, gain, and voicing outputs, and modifying one or more of the formants, pitch, gain, and voicing outputs according to the selected voice font;

recombining the formants, pitch, gain, and voicing outputs including any modifications to form a decoded output signal.

19. Circuitry of multiple interconnected electrically conductive elements configured to perform speech conversion operations comprising:

receiving signals including:

a formants signal representative of an input speech signal;

a voicing signal comprising an indication of whether the input speech signal is voiced, unvoiced, or mixed;

a pitch signal comprising a representation of fundamental frequency of the input speech signal;

a gain signal comprising a representation of energy in the input speech signal;

receiving user selection of at least one of multiple voice fonts each specifying a manner of modifying at least one of the received signals;

modifying at least one of the received signals as specified by the selected voice font;

providing an output of the received signals incorporating said modifications.

20. The circuitry of claim 19, wherein the modifying operation comprises modifying the formants signal by performing operations comprising:

converting linear predictive coding coefficients of the formants signal to linear spectral pairs;

modifying the linear spectral pairs as specified by the selected voice font;

converting the modified linear spectral pairs into linear predictive coding coefficients.

21. The circuitry of claim 19, the modifying operation comprising modifying the pitch signal by operations comprising one of the following:

multiplying the pitch signal by a predetermined coefficient;

multiplying the pitch signal by a matrix of differential coefficients over time;

replacing the pitch signal with a fixed pitch pattern of one or more levels.

22. The circuitry of claim 19, the modifying operation comprising normalizing the gain signal to a fixed value.

23. The circuitry of claim 19, the modifying operation comprising changing the voicing signal to a different value of voiced, unvoiced, or mixed.

24. The circuitry of claim 19, each voice font further specifying a filter type, the operations further comprising:

filtering the output as specified by the selected voice font.

25. The circuitry of claim 19, the modifying operation comprising:

    applying a first conversion to the formants signal;

    applying a second conversion, different than the first conversion, to the

    pitch signal.

26. Circuitry of multiple interconnected electrically conductive elements configured to perform speech conversion operations comprising:

    receiving signals including:

        a formants signal representative of an input speech signal;

        a pitch signal comprising a representation of fundamental

            frequency of the input speech signal;

    receiving user selection of at least one of multiple voice fonts each

        specifying a manner of modifying the formants signal and a

        different manner of modifying the pitch signal;

    modifying the received signals as specified by the selected voice font;

    providing an output of the received signals as modified.

27. Circuitry of multiple interconnected electrically conductive elements configured to perform speech conversion operations comprising:

    applying linear predictive coding to input speech to yield a formants

        output and a residual output;

    processing the residual output to yield respective outputs representing

        pitch, gain, and voicing of the input speech;

    receiving user selection of at least one of multiple predetermined voice

        fonts each specifying a manner of modifying at least one of the

formants, pitch, gain, and voicing outputs, and modifying one or

more of the formants, pitch, gain, and voicing outputs according to

the selected voice font;

recombining the formants, pitch, gain, and voicing outputs including any

modifications to form a decoded output signal.

28. A wireless communications device, comprising:

a transceiver coupled to an antenna;

a speaker;

a microphone;

a user interface;

a manager coupled to components including the transceiver, speaker,

microphone, and user interface to manage operation of the

components, the manager including a speech conversion system

configured to perform operations comprising:

receiving signals including:

a formants signal representative of an input speech signal;

a voicing signal comprising an indication of whether the

input speech signal is voiced, unvoiced, or mixed;

a pitch signal comprising a representation of fundamental

frequency of the input speech signal;

a gain signal comprising a representation of energy in the

input speech signal;

receiving user selection of at least one of multiple voice fonts each

specifying a manner of modifying at least one of the

received signals;

modifying at least one of the received signals as specified by the

selected voice font;

providing an output of the received signals incorporating said

modifications.

29. A wireless communications device, comprising:

a transceiver coupled to an antenna;

a speaker;

a microphone;

a user interface;

a manager coupled to components including the transceiver, speaker,

microphone, and user interface to manage operation of the

components, the manager including a speech conversion system

configured to perform operations comprising:

applying linear predictive coding to input speech to yield a

formants output and a residual output;

processing the residual output to yield respective outputs

representing pitch, gain, and voicing of the input speech;

receiving user selection of at least one of multiple predetermined

voice fonts each specifying a manner of modifying at least

one of the formants, pitch, gain, and voicing outputs, and

modifying one or more of the formants, pitch, gain, and

voicing outputs according to the selected voice font;

recombining the formants, pitch, gain, and voicing outputs

including any modifications to form a decoded output

signal.

30. A wireless communications device, comprising:

an encoder, including a linear predictive coding (LPC) analyzer coupled

to a voicing detector, a pitch searcher, and a gain calculator;

a speech conversion module including a formants modifier in

communication with the LPC analyzer, a voicing modifier in

communication with the voicing detector, a pitch modifier in

communication with the pitch searcher, a gain modifier in

communication with the gain calculator, and a voice fonts library in

communication with all of the modifiers;

a decoder comprising an excitation signal generator in communication

with the voicing modifier, the pitch modifier, and the gain modifier,

the decoder also including an LPC synthesizer coupled to the

excitation signal generator.

31. A wireless communications device, comprising:

a transceiver coupled to an antenna;

a speaker;

a microphone;

a user interface;

a manager coupled to components including the transceiver, speaker, microphone, and user interface to manage operation of the components, the manager including a speech conversion system configured to perform operations comprising:

receiving signals including:

a formants signal representative of an input speech signal;

a pitch signal comprising a representation of fundamental frequency of the input speech signal;

receiving user selection of at least one of multiple voice fonts each specifying a manner of modifying the formants signal and a different manner of modifying the pitch signal;

modifying the received signals as specified by the selected voice font;

providing an output of the received signals as modified.

32. A speech conversion system, comprising:

a transceiver coupled to an antenna;

a speaker;

a microphone;

a user interface;

means for managing operation of the transceiver, speaker, microphone, and user interface and additionally including means for speech conversion by:

receiving signals including:

a formants signal representative of an input speech signal;

a voicing signal comprising an indication of whether the

input speech signal is voiced, unvoiced, or mixed;

a pitch signal comprising a representation of fundamental

frequency of the input speech signal;

a gain signal comprising a representation of energy in the

input speech signal;

receiving user selection of at least one of multiple voice fonts each

specifying a manner of modifying at least one of the

received signals;

modifying at least one of the received signals as specified by the

selected voice font;

providing an output of the received signals incorporating said

modifications.

33. A wireless communications device, comprising:

a transceiver coupled to an antenna;

a speaker;

a microphone;

a user interface;

means for managing the transceiver, speaker, microphone, and user

interface and additionally including means for speech conversion

by:

applying linear predictive coding to input speech to yield a

formants output and a residual output;

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processing the residual output to yield respective outputs

representing pitch, gain, and voicing of the input speech;

receiving user selection of at least one of multiple predetermined

voice fonts each specifying a manner of modifying at least

one of the formants, pitch, gain, and voicing outputs, and

modifying one or more of the formants, pitch, gain, and

voicing outputs according to the selected voice font;

recombining the formants, pitch, gain, and voicing outputs

including any modifications to form a decoded output

signal.

34. A wireless communications device, comprising:

means for encoding comprising means for linear predictive coding (LPC)

analyzing and, coupled to the means for LPC analyzing, means for

voicing detection, means for pitch searching, and means for gain

calculation;

means for speech conversion including means for modifying formants

coupled to the means for LPC analyzing, means for voicing

modification coupled to the means for voicing detection, means for

modifying pitch in communication with the means for pitch

searching, means for modifying gain in communication with the

means for gain calculation, and a voice fonts library;

decoder means comprising means for LPC synthesizing and, coupled to

the means for LPC synthesizing, means for excitation signal

generation additionally coupled to the means for voicing

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modification, the means for pitch modification, and the means for gain modification.

35. A wireless communications device, comprising:

a transceiver coupled to an antenna;

a speaker;

a microphone;

a user interface;

means for managing components including the transceiver, speaker, microphone, and user interface to manage operation of the components, the means for managing including means for performing speech conversion system by:

receiving signals including:

a formants signal representative of an input speech signal;

a pitch signal comprising a representation of fundamental frequency of the input speech signal;

receiving user selection of at least one of multiple voice fonts each specifying a manner of modifying the formants signal and a different manner of modifying the pitch signal;

modifying the received signals as specified by the selected voice font;

providing an output of the received signals as modified.